XX. *An Account of the ſenſitive Quality of the Tree* Averrhoa Carambola. *In a Letter from* Robert Bruce, *M.D. to Sir* Joſeph Banks, *Bart. P.R.S.*

Read April 14, 1785.

THE Averrhoa Carambola of LINNÆUS, a tree called in Bengal the Camruc or Camrunga, is poſſeſſed of a power ſomewhat ſimilar to thoſe ſpecies of Mimoſa which are termed ſenſitive plants; its leaves, on being touched, move very perceptibly.

In the Mimoſa the moving faculty extends to the branches; but, from the hardneſs of the wood, this cannot be expected in the Camrunga. The leaves are alternately pinnated, with an odd one; and in their moſt common poſition in the day-time are horizontal, or on the ſame plane with the branch from which they come out. On being touched, they move themſelves downwards, frequently in ſo great a degree that the two oppoſite almoſt touch one another by their under ſides, and the young ones ſometimes either come into contact or even paſs each other.

The whole of the leaves of one pinna move by ſtriking the branch with the nail of the finger, or other hard ſubſtance; or each leaf can be moved ſingly, by making an impreſſion that ſhall not extend beyond that leaf. In this way, the leaves of one ſide of the pinna may be made to move, one after another, whilſt the oppoſite continue as they were; or you may make them

them move alternately, or, in ſhort, in any order you pleaſe, by touching in a proper manner the leaf you wiſh to put in motion. But if the impreſſion, although made on a ſingle leaf, be ſtrong, all the leaves on that pinna, and ſometimes on the neighbouring ones, will be affected by it.

What at firſt ſeemed ſurpriſing was, that notwithſtanding this apparent ſenſibility of the leaf, I could with a pair of ſharp ſciſſars make large inciſions in it, without occaſioning the ſmalleſt motion; nay, even cut it almoſt entirely off, and the remaining part ſtill continue unmoved; and that then, by touching the wounded leaf with the finger or point of the ſciſſars, motion would take place as if no injury had been offered. But, on further examination, I found, that although the leaf was the oſtenſible part which moved, it was in fact entirely paſſive, and that the petiolus was the ſeat both of ſenſe and action: for although the leaf might be cut in pieces, or ſqueezed with great force, provided its direction was not changed, without any motion being occaſioned; yet, if the impreſſion on the leaf was made in ſuch a way as to affect the petiolus, the motion took place. When, therefore, I wanted to confine the motion to a ſingle leaf, I either touched it ſo as only to affect its own petiolus, or, without meddling with the leaf, touched the petiolus with any ſmall-pointed body, as a pin or knife.

By compreſſing the univerſal petiolus near the place where a partial one comes out, the leaf moves in a few ſeconds, in the ſame manner as if you had touched the partial petiolus.

Whether the impreſſion be made by puncture, percuſſion, or compreſſion, the motion does not inſtantly follow; generally ſeveral ſeconds intervene, and then it is not by a jirk, but regular and gradual. Afterwards, when the leaves return to their former ſituation, which is commonly in a quarter of an hour or leſs, it is in ſo ſlow a manner as to be almoſt imperceptible.

On ſticking a pin into the univerſal petiolus at its origin, the leaf next it, which is always on the outer ſide, moves firſt; then the firſt leaf on the oppoſite ſide, next the ſecond leaf on the outer, and ſo on. But this regular progreſſion ſeldom continues throughout; for the leaves on the outer ſide of the pinna ſeem to be affected both more quickly, and with more energy, than thoſe of the inner, ſo that the fourth leaf on the outer ſide frequently moves as ſoon as the third on the inner; and ſometimes a leaf, eſpecially on the inner ſide, does not move at all, whilſt thoſe above and below it are affected in their proper time. Sometimes the leaves at the extremity of the petiolus move ſooner than ſeveral others which were nearer the place where the pin was put in.

On making a compreſſion with a pair of pincers on the univerſal petiolus, between any two pair of leaves, thoſe above the compreſſed part, or nearer the extremity of the petiolus, move ſooner than thoſe under it, or nearer the origin; and frequently the motion will extend upwards to the extreme leaf, whilſt below it perhaps does not go farther than the neareſt pair.

If the leaves happen to be blown by the wind againſt one another, or againſt the branches, they are frequently put in motion; but when a branch is moved gently, either by the hand or the wind, without ſtriking againſt any thing, no motion of the leaves takes place.

When left to themſelves in the day-time, ſhaded from the ſun, wind, rain, or any diſturbing cauſe, the appearance of the

the leaves is different from that of other pinnated plants. In the laſt a great uniformity ſubſiſts in the reſpective poſition of the leaves on the pinna; but here ſome will be ſeen on the horizontal plane, ſome raiſed above it, and others fallen under it; and in an hour or ſo, without any order or regularity, which I could obſerve, all theſe will have changed their reſpective poſitions. I have ſeen a leaf, which was high up, fall down; this it did as quickly as if a ſtrong impreſſion had been made on it, but there was no cauſe to be perceived.

Cutting the bark of the branch down to the wood, and even ſeparating it about the ſpace of half an inch all round, ſo as to ſtop all communication by the veſſels of the bark, does not for the firſt day affect the leaves, either in their poſition or their aptitude for motion.

In a branch, which I cut through in ſuch a manner as to leave it ſuſpended only by a little of the bark no thicker than a thread, the leaves next day did not riſe ſo high as the others; but they were green and freſh, and, on being touched, moved, but in a much leſs degree than formerly.

After ſun-ſet the leaves go to ſleep, firſt moving down ſo as to touch one another by their under ſides; they therefore perform rather more extenſive motion at night of themſelves than they can be made to do in the day-time by external impreſſions. With a convex lens I have collected the rays of the ſun on a leaf, ſo as to burn a hole in it, without occaſioning any motion. But when the experiment is tried on the petiolus, the motion is as quick as if from ſtrong percuſſion, although the rays were not ſo much concentrated as to cauſe pain when applied in the ſame degree on the back of the hand; nor had the texture of the petiolus been any ways changed by this; for next day it could not be diſtinguiſhed, either by its appearance or moving power, from thoſe on which no experiment had been made.

The leaves move very faſt from the electrical ſhock, even although a very gentle one; but the ſtate of the atmoſphere was ſo unfavourable for experiments of this kind, that I could not purſue them ſo far as I wiſhed.

There are two other plants mentioned as ſpecies of this genus by LINNÆUS. The firſt, the Averrhoa Bilimbi, I have not had an opportunity of ſeeing. The other, or Averrhoa Acida, does not ſeem to belong to the ſame claſs; nor do its leaves poſſeſs any of the moving properties of the Carambola. LINNÆUS's generic deſcription of the Averrhoa, as of many other plants in this country which he had not an opportunity of ſeeing freſh, is not altogether accurate. The petals are connected by the lower part of the lamina, and in this way they fall off whilſt the ungues are quite diſtinct. The ſtamina are in five pairs, placed in the angles of the germen. Of each pair only one ſtamen is fertile, or furniſhed with an anthera. The filaments are curved, adapted to the ſhape of the germen. They may be preſſed down gently, ſo as to remain; and then, when moved a little upwards, riſe with a ſpring. The fertile are twice the length of thoſe deſtitute of antheræ.

Calcutta, Nov. 23, 1783.

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